

**REMARKS**

Entry of the foregoing, re-examination and reconsideration of the application identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.112 and in light of the remarks which follow, are respectfully requested.

By the above amendments, claims 1, 4, 9, 16 and 17 have been amended to conform same with standard U.S. claims drafting practice. Claims 1 and 11 have been amended for readability purposes. Claim 1 has been amended to replace "the said" with "said." Claims 8, 10-12 and 19 have been amended to delete the word "type." Claims 6, 7 and 9 have been amended to delete the word "similar." Claim 18 has been amended to recite "a density of less than 0.9 g/cm<sup>3</sup>." Support for this amendment can be found in the specification at least at page 9, lines 12 and 13.

In the Official Action, claims 1, 8-12, 16 and 19 stand rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at section 2 of the Official Action. In this regard, claim 1 has been amended to replace "the said" with "said." Claims 8, 10-12 and 19 have been amended to delete the word "type."

Claim 16 recites the phrase "polar functional groups capable of reacting with the polyamide matrix." The Official Action does not provide any reason in support of the rejection of claim 16 for reciting the phrase "capable of." In this regard, Applicants note that there is nothing inherently wrong with defining some part of an invention in functional terms. See, e.g., M.P.E.P. 2173.05(g). In the present case, the mere recitation of the phrase "capable of" does not render claim 16 indefinite. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 8 stands rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at section 3 of the Official Action. In this regard, it appears from the comments set forth in the Official Action that the plain meaning of the phrase "arranged alternately" as recited in claim 8 has been misunderstood. Claim 8 recites that "the internal intermediate layers and the external intermediate layers are arranged alternately in the transverse direction of the structure." That is, according to this exemplary embodiment, the multilayer structure includes internal intermediate layers and external intermediate layers which are arranged to alternate with each other. Thus, it is apparent that claim 8 is not indefinite for the reasons set forth in the Official Action. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 13 stands rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at section 4 of the Official Action. In this regard, the Official Action states that the specification "makes no reference to the chain extender which is claimed." However, the "chain extender" recited in claim 13 is discussed in the instant specification at least from page 7, line 28 to page 8, line 4. Accordingly, withdrawal of this rejection is now in order.

Claims 6, 7 and 9 stand rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at section 5. In this regard, the term "similar" has been deleted from those claims. Accordingly, withdrawal of this rejection is now in order.

Claim 18 stands rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at section 6 of the Official Action. Claim 18 has been amended to recite "a density of less than 0.9 g/cm<sup>3</sup>." Accordingly, withdrawal of this rejection is now in order.

In the only art rejection, claims 1-7, 9-12 and 14-20 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,219,003 (*Kerschbaumer*) in view of European patent document No. 0 646 627 (EP '627). This rejection should be withdrawn for at least the following reasons.

The present invention relates to a polyamide-based multilayer structure, suitable in particular for the manufacture of tubes or pipes intended to transport liquid fluids such as alcohols, liquid fuels, fuels which may contain oxygen compounds such as, for example, alcohols or refrigerants (specification at page 1, lines 4-9). Advantageously, the multilayer structure of the present invention can have improved barrier properties, particularly to hydrocarbon mixtures used as fuel, an improved resistance to environmental conditions, and an increased dimensional stability when it is in contact with fuels which contain oxygen (specification at page 3, lines 11-20 and page 5, lines 3-13). For example, with respect to the improved resistance to environmental conditions, an exemplary embodiment of the present invention withstood a stress cracking test in a ZnCl<sub>2</sub> solution for over 500 hours (specification at pages 14 and 15).

*Kerschbaumer* relates to a fuel line which is made up of several layers of polyamide. *Kerschbaumer* discloses that a multi-layered fuel line has an external layer consisting of impact resistance-modified types of polyamide which can contain a plasticizer, and of a middle barrier layer consisting of a polyamide substantially free of impact resistance modifiers (*Kerschbaumer* at col. 2, lines 28-33). *Kerschbaumer* also discloses that an internal layer of the tubing preferably consists of polyamide 6 (*Kerschbaumer* at col. 2, lines 39 and 40).

*Kerschbaumer* does not disclose or suggest each feature of the present invention.

For example, *Kerschbaumer* does not disclose or suggest a multilayer structure comprising at least one external layer formed from a composition comprising as a polymer matrix a polyamide composition comprising: (i) a polyamide thermoplastic copolymer obtained by copolymerization of  $\epsilon$ -caprolactam with at least one of the monomers comprising an amino acid comprising at least 9 carbon atoms or a corresponding lactam, or a mixture of hexamethylenediamine with a diacid comprising at least 9 carbon atoms. *Kerschbaumer* also does not disclose or suggest a mixture of at least the above-described thermoplastic polyamide copolymer and at least one second thermoplastic polyamide or copolyamide. In this regard, *Kerschbaumer* discloses that an external layer consists of impact resistance-modified types of polyamide which can contain a plasticizer (*Kerschbaumer* at col. 2, lines 28-31). However, *Kerschbaumer* has no disclosure or suggestion of an external layer formed from a composition comprising a polyamide composition comprising : (i) a polyamide thermoplastic copolymer obtained by copolymerization of  $\epsilon$ -caprolactam with at least one of the monomers comprising an amino acid comprising at least 9 carbon atoms or a corresponding lactam, or a mixture of hexamethylenediamine with a diacid comprising at least 9 carbon atoms, as presently claimed. In addition, *Kerschbaumer* certainly has no recognition of the advantages associated with the use of the inventive multilayer structure such as, for example, the improved cracking resistance discussed above.

*Kerschbaumer* discloses at Example 2 thereof a structure that includes an internal layer of Grilon XE 3139, a middle layer of 50% Grilamid ELY20NZ and 50% Grilon CA6E, and an external layer of Grilamid XE 3148 (*Kerschbaumer* at Table 1).

*Kerschbaumer* discloses that Grilon CA6E "is an amorphous copolyamide based on caprolactam/laurolactam" (*Kerschbaumer* at col. 3, lines 30 and 31). However, it is the middle layer of the *Kerschbaumer* tube that includes Grilon CA6E, not the external layer. Accordingly, *Kerschbaumer* does not disclose or suggest the presently claimed external layer.

Absent Applicants' own disclosure, one of ordinary skill in the art would not have been motivated to modify the *Kerschbaumer* tube to include Grilon CA6E in the external layer thereof. In this regard, *Kerschbaumer* discloses that the cold impact resistance of a multi-layered fuel line can be very high if a brittle barrier layer forms the middle layer of the tubing (*Kerschbaumer* at col. 2, lines 4-7). Thus, *Kerschbaumer* addresses the advantages associated with using a brittle middle (barrier) layer of a multi-layered fuel line and has no disclosure or suggestion of using the material of the middle (barrier) layer to form the external layer, let alone the disclosed Grilon CA6E.

Moreover, assuming, *arguendo*, that motivation exists to modify the *Kerschbaumer* tube to include Grilon CA6E in the external layer thereof, Grilon CA6E cannot be properly considered the same as or suggestive of the claimed external layer. In this regard, *Kerschbaumer* merely discloses that Grilon CA6E is "an amorphous copolyamide based on caprolactam/laurolactam" (*Kerschbaumer* at col. 3, lines 30 and 31). Certainly, this "amorphous copolyamide based on caprolactam/laurolactam" cannot be properly equated with the external layer formed in the manner recited in claim 1. Further, the Official Action does not provide any evidence, let alone show with the requisite certainty, that the Grilon CA6E disclosed by *Kerschbaumer* contains the claimed composition comprising a

polyamide composition comprising : (i) a polyamide thermoplastic copolymer obtained by copolymerization of  $\epsilon$ -caprolactam with at least one of the monomers comprising an amino acid comprising at least 9 carbon atoms or a corresponding lactam, or a mixture of hexamethylenediamine with a diacid comprising at least 9 carbon atoms.

In addition, *Kerschbaumer* has no disclosure or suggestion of any ratio between  $\epsilon$ -caprolactam and the total amount of hexamethylenediamine and diacid and/or an amino acid which form a polyamide thermoplastic copolymer, let alone the ratio of between 4 and 9 as recited in claim 1. Thus, for at least the reasons set forth above, *Kerschbaumer* fails to disclose or suggest each feature of the present invention.

*Kerschbaumer* also fails to disclose or suggest aspects of the present invention as defined by the dependent claims. In this regard, as correctly noted in the Official Action at page 4, *Kerschbaumer* does not disclose or suggest that at least some of the impact modifiers comprise polar functional groups capable of reacting with the polyamide matrix, as recited in claim 16. Further, *Kerschbaumer* does not disclose or suggest that an impact modifier is an ultra-low-density polyethylene (ULDPE) having a density of less than 0.9 g/cm<sup>3</sup> and a melt flow index of between 0.1 and 7 g/10 min measured at 190°C under a load of 2.16 kg. In this regard, *Kerschbaumer* discloses that "[t]he impact resistance modifiers . . . are generally polymeric rubbery components, i.e., ethylene and other olefinic components" (*Kerschbaumer* at col. 2, lines 42-45). Certainly, this disclosure is not suggestive of the impact modifiers recited in claims 16 and 18.

EP '627 relates to polymeric compositions constituted by 6 polyamide and containing at least one ultra low density polyethylene, suitably modified by grafting with

unsaturated monomeric compounds containing functional groups of acidic or anhydride type, or their derivatives (EP '627 at page 2, lines 1-4).

EP '627 fails to cure each of the above-described deficiencies of *Kerschbaumer*. In this regard, the Examiner relies on EP '627 for disclosing an acid-modified ultra low density polyethylene which is used as an impact modifier of polyamide 6 (Official Action at page 4). However, like *Kerschbaumer*, EP '627 does not disclose or suggest a multilayer structure comprising at least one external layer formed from a composition comprising as a polymer matrix a polyamide composition comprising: (i) a polyamide thermoplastic copolymer obtained by copolymerization of  $\epsilon$ -caprolactam with at least one of the monomers comprising an amino acid comprising at least 9 carbon atoms, or a corresponding lactam, or a mixture of hexamethylenediamine with a diacid comprising at least 9 carbon atoms. In fact, EP '627 does not even relate to a multilayered structure and merely discloses the use of the compositions thereof in the manufacture of "moulded and/or extruded pieces" (EP '627 at col 3 and 4). As such, EP '627 is not properly combinable with *Kerschbaumer* in the manner suggested in the Official Action.

It is therefore apparent that no *prima facie* case of obviousness has been established. Accordingly, for at least the reasons set forth above, withdrawal of this §103(a) rejection is respectfully requested.

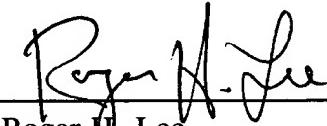
From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such action is earnestly solicited.

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Attorney's Docket No. 022701-854  
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If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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**Attachment to Amendment dated August 13, 2001**

**Marked-up Claims 1, 4, 6-12 and 16-18**

1. (Twice Amended) Multilayer structure comprising at least one internal layer and at least one external layer, wherein at least the internal layer is formed from a composition comprising at least one thermoplastic polyamide and at least one impact-resistance modifier present at a concentration by weight of between 10 and 50% of said composition, and in that at least the external layer is formed from a composition comprising as a polymer matrix a polyamide composition comprising:

- (i) a polyamide thermoplastic copolymer obtained by copolymerization of  $\epsilon$ -caprolactam with at least one of the monomers [selected from the group] comprising:
- an amino acid comprising at least 9 carbon atoms, or [the] a corresponding lactam,  
**or**
  - a mixture of hexamethylenediamine with a diacid comprising at least 9 carbon atoms,
- the ratio by weight between the  $\epsilon$ -caprolactam and the total amount of hexamethylenediamine and diacid and/or [the] said amino acid being between 4 and 9, or
- (ii) a mixture of at least [the] said thermoplastic polyamide copolymer (i) and at least one second thermoplastic polyamide or copolyamide obtained by polymerization of monomers comprising fewer than 9 carbon atoms, the content by weight of the second polymer or copolymer in the polymer matrix being between 0 and 80% by weight.

**Attachment to Amendment dated August 13, 2001**

**Marked-up Claims 1, 4, 6-12 and 16-18**

4. (Twice Amended) Structure according to claim 1, [which] wherein it forms a pipe, a tube or the walls of a chamber.

6. (Twice Amended) Structure according to claim 5, wherein at least one of said intermediate layers are formed from [a] the composition [similar to the one] forming the external layer of the structure.

7. (Twice Amended) Structure according to claim 5, wherein at least one of the intermediate layers are formed from [a] the composition [similar to the one] forming the internal layer.

8. (Twice Amended) Structure according to claim 5, wherein the [internal-type] internal intermediate layers and the [external-type] external intermediate layers are arranged alternately in the transverse direction of the structure.

9. (Twice Amended) Structure according to claim 5, [which] wherein it comprises outer layers formed by [a] the composition [similar to the one] forming the external layer, and at least one intermediate layer formed by [a] the composition [of the type] forming the [internal-type] internal layers.

**Attachment to Amendment dated August 13, 2001**

**Marked-up Claims 1, 4, 6-12 and 16-18**

10. (Twice Amended) Structure according to claim 1, wherein the composition forming the external layer and/or the [external-type] external intermediate layers comprises a first 6/6-36 thermoplastic copolyamide [of the 6/6-36 type,] and a second PA 6 thermoplastic polyamide [of the PA 6 type].

11. (Twice Amended) Structure according to claim 1, wherein the composition forming the external layer and/or the [external-type] external intermediate layers comprises [a] an impact modifier, optionally comprising functional groups which can react with the polyamide or polyamides.

12. (Twice Amended) Structure according to claim 1, wherein the composition forming the internal layer and/or the [internal-type] internal intermediate layers has a modulus of less than 1500 MPa.

16. (Twice Amended) Structure according to claim 14, [characterized in that] wherein at least some of the impact modifiers comprise polar functional groups capable of reacting with the polyamide matrix.

**Attachment to Amendment dated August 13, 2001**

**Marked-up Claims 1, 4, 6-12 and 16-18**

17. (Twice Amended) Structure according to claim 16, [characterized in that] wherein the polar functional groups are selected from the group [comprising] consisting of acid, anhydride, acrylic, methacrylic and epoxy functional groups.

18. (Twice Amended) Structure according to claim 15, wherein the impact modifier is an ultra-low-density polyethylene (ULDPE) having a density of less than 0.9 g/cm<sup>3</sup> and a melt flow index of between 0.1 and 7 g/10 min measured at 190°C under a load of 2.16 kg.